AMENDMENTS TO THE DRAWINGS

In the office action mailed June 28, 2006, the Examiner objected to the drawings because the boxes in Figure 4 were not labeled. With this response, Applicant submits a replacement sheet that includes an amended Figure 4 with the boxes labeled in accordance with the Examiner's objection. Applicant therefore respectfully requests that the Examiner withdraw the objection to the drawings.

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REMARKS

1. Summary of Office Action Mailed June 28, 2006

In the office action mailed June 28, 2006, with claims 11-26 pending, the Examiner (i) objected to the drawings and (ii) rejected claims 11-26 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,137,281 (Philips et al.).

2. Pending claims

Presently pending in this application are claims 11-26, of which claims 11 and 17 are independent. Claims 15 and 17 are amended herein.

3. The Prior Art

Philips discloses a magnetic back-to-back locator for identifying corresponding locations on two sides of an opaque surface. Philips discloses the use of two corresponding devices to accomplish this. Both devices have a marking arrangement, which is essentially an opening in each of the devices where a marking instrument can be used to mark the underlying surface. One of the two devices has multiple – such as 2 or 3 – magnetic sensors at particular locations. The second device has the same number of magnetic field generators (i.e., magnets) as the first device has sensors, at locations that match up with the sensors on the first device.

Philips discloses a number of arrangements, such as having two sensor/magnet pairs and the marking arrangement form a triangle or a straight line on each of the two devices, as well as having four sensor/magnet pairs form a cross on each of the two devices, with the marking arrangements at the center. In all of Philips' arrangements, there is a one-to-one correspondence between the sensors on the first device and the magnets on the second.

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Furthermore, Philips discloses having an indicator, such as a light emitting diode (LED), wired in series with each sensor on the first device. When a given sensor is lined up with a magnet on the second device on the other side of the opaque surface, the indicator lights up or gives some other sensory indication. Thus, when all of the indicators on the first device indicate a sensor/magnet alignment, the marking arrangement on the first device and the marking arrangement on the second device are at corresponding locations on either side of the opaque surface. Both sides of the surface can thus be marked at the corresponding locations.

4. Response to Examiner's Rejections

In the office action mailed June 28, 2006, the Examiner rejected claims 11-26 under 35 U.S.C. § 102(b) as anticipated by Philips. Among claims 11-26, the two independent claims are claims 11 and 17. For at least the reasons explained below, Applicant respectfully submits that Philips does not anticipate either of claims 11 or 17, and thus does not anticipate dependent claims 12-16 or 18-26. Applicant respectfully requests reconsideration by the Examiner.

a. Claims 11-16

Claim 11 is directed to a method of locating an object lying behind an opaque surface, rendering the object non-visible. In one embodiment, the opaque surface may be the skin of an airplane wing, while the object may be a hole in a spar or rib to which the skin will be attached by drilling a hole through the skin such that the hole in the skin and the hole in the spar are aligned, and then using a suitable fastener to join the two. In accordance with the method, a variable strength magnetic field is provided in the neighborhood of the object. This step may be carried out by, for example, placing a magnet or ferromagnetic object in the hole in the spar.

Also in accordance with the method, the magnetic field strength is sensed at a plurality of positions relative to the object using an array of Hall effect magnetic sensors, which is associated

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geometrically with a machining guide, such that the machining guide and the array of sensors are fixed positionally one relative to the other. As examples, the array of Hall effect sensors could be in the form of a cruciform array, while the machining guide could be a cylindrical opening through which a drill bit may pass to drill a hole in the skin. Further in accordance with the method of claim 11, the sensors are interrogated to determine the value of the field strength at at least the majority of the sensors. The method further comprises analyzing the sensor responses to determine the displacement between the object and the machining guide, and moving the array and machining guide to a position in which the displacement is a minimum.

Philips does not disclose the step of analyzing the sensor responses to determine the displacement between the object and the machining guide. Rather, Philips only discloses determining, in a binary fashion and on a sensor-by-sensor basis, whether or not each sensor is aligned with a magnet on the other side of the surface. Philips does not disclose determining displacement (e.g., distance, direction, etc.) between where one is and where one wants to be, when trying to locate a non-visible object. What Philips does disclose is a process of blind trial and error until all of the sensor-associated indicators indicate that their corresponding sensors are aligned with a magnet. In Philips' words, "luck is required." (See Philips, 5:29-65)

The method of claim 11, on the other hand, involves analyzing the sensor responses to determine the displacement between the object and the machining guide. This displacement may be displayed as a non-alignment of crosshairs (representing the machining guide) and a circle (representing the object) on a display. An operator would then know which way to move the machining guide to align it with the object. In another embodiment, this displacement may be communicated to an automated device that could responsively move the machining guide into alignment with the object.

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Philips discloses no such analysis of sensor data in any collective way to determine a computed output such as displacement of a machining guide and an object. In Philips, an operator would basically blindly move either the sensor-containing device or the magnet-containing device until at least one sensor-indicator indicates alignment, and then essentially guess which way to move or rotate one of the two devices to align it with the other.

Therefore, Philips does not anticipate claim 11. Furthermore, Philips does not anticipate dependent claims 12-16, for at least the reason that those claims depend from an allowable claim.

b. Claims 17-26

Independent claim 17 is directed to an apparatus for locating a non-visible object behind an opaque surface. The apparatus comprises means for collecting and analyzing outputs from sensors to provide an indication of the variation of a magnetic field associated with an object relative to a position of a base member. For reasons similar to those given above in connection with independent claim 11, Philips does not disclose this element, and thus does not anticipate independent claim 17.

Philips does not disclose providing any sort of indication of in what way (e.g., direction, distance, etc.) a base member may be misaligned with a magnetic field associated with a non-visible object. Philips discloses providing only simple, binary, sensor-by-sensor, "aligned or not aligned" indications. Like the method of claim 11, the apparatus of claim 17 would indicate to a person or to a machine which way to move a sensing apparatus to align it with a magnet on the other side of an opaque surface. Philips does not disclose any mechanism for processing or analyzing sensor data in any collective way to provide that type of information.

Therefore, Philips does not anticipate claim 17. Furthermore, Philips does not anticipate dependent claims 18-26, for at least the reason that those claims depend from an allowable claim.

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5. Conclusion

Applicant submits that all of the pending claims are now in condition for allowance. Therefore, Applicant respectfully requests favorable action. Should the Examiner have any questions, the Examiner is encouraged to contact the undersigned at 312-913-3317.

Respectfully submitted,

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Date: September 28, 2006

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